



Extension of the SNAP Model Editor to Support the RELAP5-3D[©] Code

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INFORMATION
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Design Objectives

- Provide a wrap-around common engineering interface to multiple analysis codes.
- Provide a graphical view of the flow, heat and logic model network.
- Share design information from a common, controlled database.
- Provide user-friendly tools and wizards and perform on-the-fly renodalization.
- Improve consistency and quality assurance.



Wrap-around Common Engineering Environment

PRE-PROCESSOR GUI (SNAP BASED)

INTEGRATED CODE SYSTEM

POST-PROCESSOR

Background

- Initial funding from the NRC to support
 - RELAP5 Mod3.3
 - TRACE (formerly TRAC-M)
- Included hydraulics, heat structures, control systems and point kinetics
- Cross-platform design
 - first written in C++ with toolkits
 - later rewritten using Java1.2
 - now Java1.4 compliant



Extensions for RELAP5-3D

- Modeling Options
 - development options
 - print control
- Multi-dimension Component
 - based on work done for the TRACE vessel
 - Cylindrical and Cartesian geometries
- Pressurizer Component
- Parametric variable names

Nodal Kinetics

- Cartesian and hexagonal geometries
- Zone and composition assignments are displayed using mesh tables.
- Supported Feedback types
 - RAMONA
 - HWR
 - GEN

Component Object Model

Physical data is entered which can then be divided into the calculation mesh.

- Containers
 - Volumes
 - Heat Slabs
 - Control Blocks
- Links
 - junctions
 - logic flow

Code to Code Translation

- Geometry based on “metadata” representation
 - first extract the physical data
 - then create new code specific objects
- Model options are based (as much as possible) on physical properties and user preferences. Remainder will be supplied through user interaction.

Renodalization

Nodalization View for Pipe No. 152

Renodalize Split Cell Join Cells

Node Number	Volume ft ³	Length ft	Area ft ²
1	15.924024	22.079900	0.721200
2	15.924024	22.079900	0.721200
3	15.924024	22.079900	0.721200
Current Total	47.772072	66.239700	
Diff	0.0	0.0	

Edit Physical Properties Close

Nodalization View for Pipe No. 152

Renodalize Split Cell Join Cells

Node Number	Volume ft ³	Length ft	Area ft ²
1	15.924024	22.079900	0.721200
2	31.848048	44.159800	0.721200
Current Total	47.772072	66.239700	
Diff	0.0	0.0	
Actual Total	47.772072	66.239700	

Edit Physical Properties Close

Renodalization Cont.

Nodalization View for Pipe No. 152

Renodalize Split Cell Join Cells

Node Number	Volume ft ³	Length ft	Area ft ²
1	15.924024	22.079900	0.721200
2	6.369610	8.831960	0.721200
3	6.369610	8.831960	0.721200
4	6.369610	8.831960	0.721200
5	6.369610	8.831960	0.721200
6	6.369610	8.831960	0.721200
Current Total	47.772072	66.239700	
Diff	0.0	0.0	
Actual Total	47.772072	66.239700	

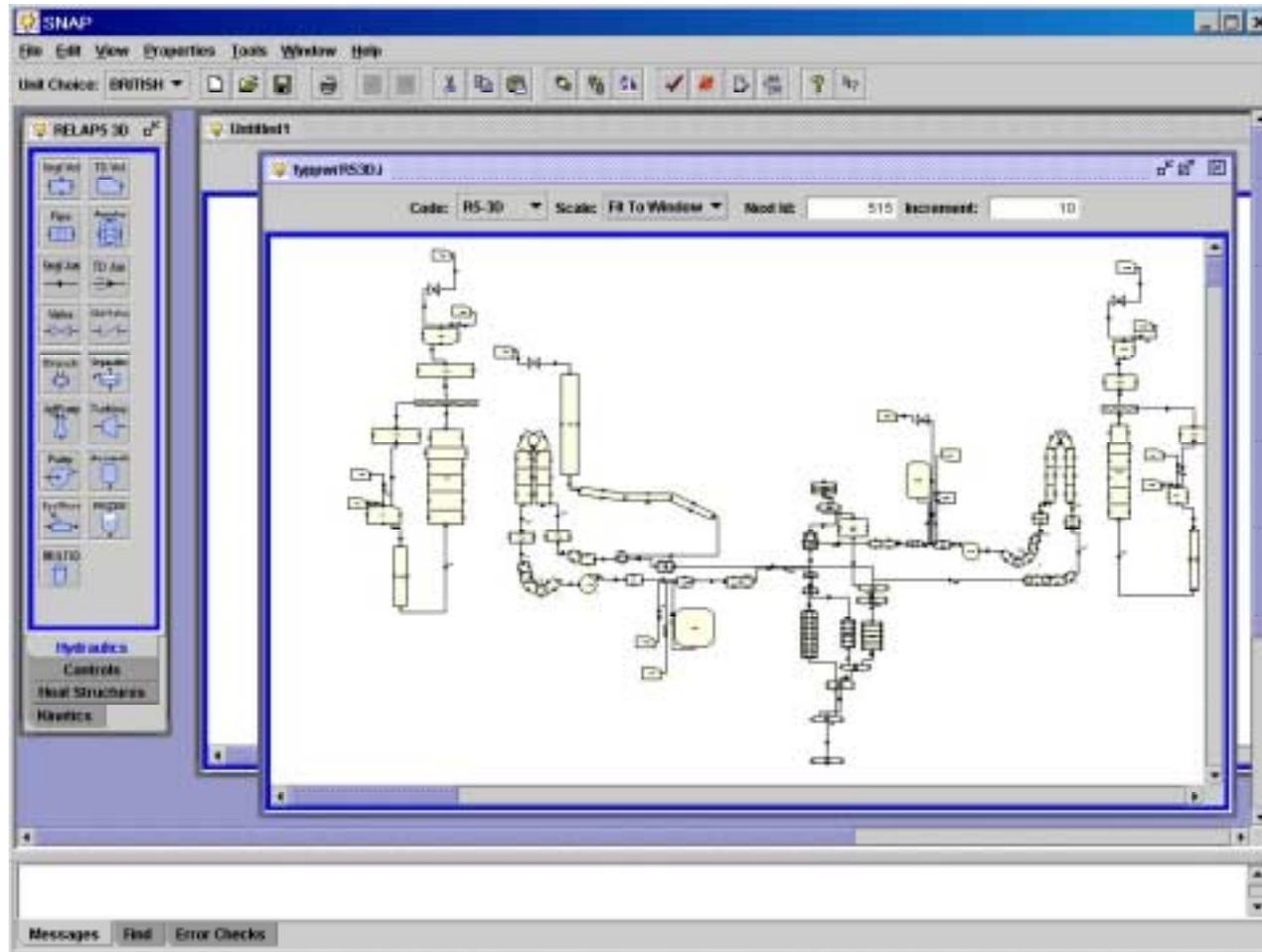
Edit Physical Properties Close



User Interface Design



Model Editor Main Window (typpwr model shown)





Multi-dimension Component

Nodalization View for Multid No. 20

Flow Type: Velocity

X Interval	Y Interval	Z Interval	Face	Hyd.Diam. m	Area Factor	Water V. m/s	Steam V. m/s
1	1	1	2	0.0	1.000000	0.0	0.0
1	1	1	4	0.0	1.000000	0.0	0.0
1	1	1	6	0.0	1.000000	0.0	0.0
1	1	2	2	0.0	1.000000	0.0	0.0
1	1	2	4	0.0	1.000000	0.0	0.0
1	1	2	6	0.0	1.000000	0.0	0.0
1	1	3	2	0.0	1.000000	0.0	0.0
1	1	3	4	0.0	1.000000	0.0	0.0
1	2	1	2	0.0	1.000000	0.0	0.0
1	2	1	4	0.0	1.000000	0.0	0.0
1	2	1	6	0.0	1.000000	0.0	0.0
1	2	2	2	0.0	1.000000	0.0	0.0
1	2	2	4	0.0	1.000000	0.0	0.0
1	2	2	6	0.0	1.000000	0.0	0.0
1	2	3	2	0.0	1.000000	0.0	0.0
1	2	3	4	0.0	1.000000	0.0	0.0
1	3	1	2	0.0	1.000000	0.0	0.0
1	3	1	6	0.0	1.000000	0.0	0.0
1	3	2	2	0.0	1.000000	0.0	0.0
1	3	2	6	0.0	1.000000	0.0	0.0
1	3	3	2	0.0	1.000000	0.0	0.0
2	1	1	2	0.0	1.000000	0.0	0.0
2	1	1	4	0.0	1.000000	0.0	0.0

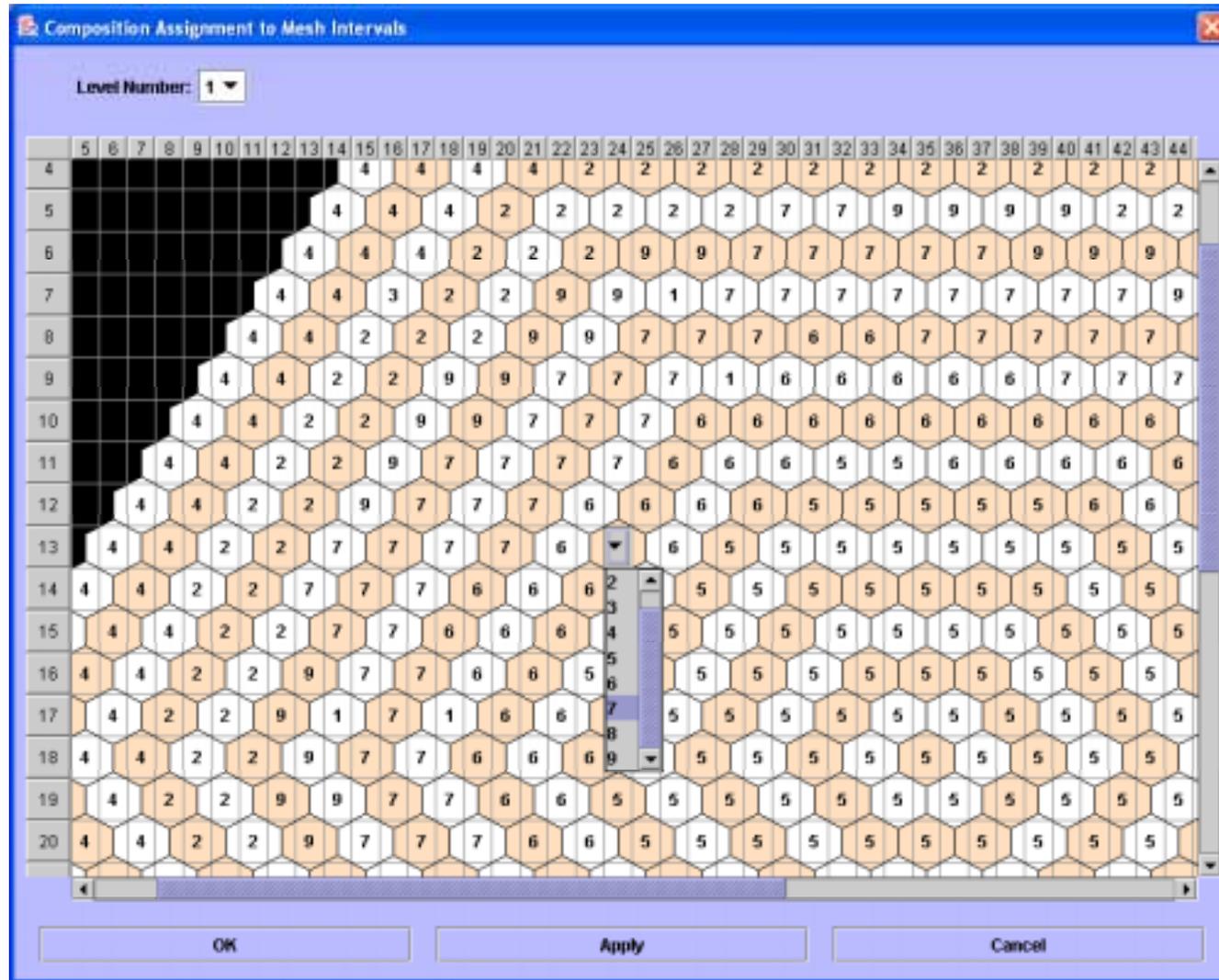
Control Panel: X-Y, Zoom: 1.00, Rotate

Navigation: OK, Apply, Cancel

Buttons: Axial Nodalization, X Interval Nodalization, Y Interval Nodalization, Fluid Conditions, Flow Conditions, Volume Friction, Junction Control Flags, Edit Physical Properties



Nodal Kinetics



Work In Progress

- Component Grouping
 - simplify the display by allowing sets of components to be grouped as a composite
 - does not change any physical data
- Intelligent Renodalization Wizard
 - Current code can only divide 1 or more cells in a pipe into equal area cells.
 - New procedure acts on a set of connected components or the whole model.
 - Uses experience-based rules.

Conclusion

- Flexible and extensible architecture
- Provides visual representation of complex input models
- Automate repetitive tasks
 - Consistent with engineering guidelines
 - Decrease user effects